

CIVIL ENGINEERING - THE IDEAL PROFESSION

Remarks by Dr. Ellis L. Armstrong on being installed as the
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National Honorary Civil Engineering Fraternity
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To receive an honor as I have tonight is a most sobering experience. In a way it is somewhat bewildering to me as a farm boy from the wilds of Southern Utah - but reflecting a bit quickly brings an awareness that this really is a recognition of the many wonderful people with whom I have been associated over the years - in my family, in my schooling, and in my career - a recognition of the wisdom of my mother and dad and others in guiding me into the exciting, adventurous Civil Engineering profession as my life's work - and to the extremely good fortune I've had in being a part of many of the top engineering projects of this age.

To have been involved in the Reclamation projects of the great American west; to have 30 dams that my youngsters and I claim as "ours"; to have been part of the High Aswan Dam on the Nile River, the St. Lawrence Power and Seaway Project, the highway network of my beloved Utah, the National Federal Aid Highway system including the Interstate; and to have had a part in the Civil Engineering Achievement Award Projects of the St. Lawrence, the Glen Canyon Dam, the Minuteman Missile Program, the Chesapeake Bay Crossing; all make me the most fortunate of men.

There are sound and basic reasons why I'm so enthusiastic about Civil Engineering as a wonderful, magnificent, ideal profession. It is well to review some of these, I think, as too much of our outlook these days is colored by the cynical pessimism of our times. We sometimes tend to forget the purpose of life and overlook, perhaps, progress that has been made and the good life that we have today which Civil Engineering has made possible.

When the Good Lord created the earth, he never finished it. Nothing is all done, nothing is ended. He wisely provided for continuing vibrant and throbbing growth, for creation, throughout all time. He left mountains that were impassable, forests that were impenetrable; wild rivers that were uncrossable and uncontrollable; rainfall that was erratic producing deserts and rainforests; storms that brought forth hurricanes and rampaging floods and lack of storms that produced searing droughts; He left the heat of summer and the cold of winter.

He provided ample natural resources for the life of man, but they were resources which require work and knowledge and cooperation

and will to develop and use; resources that must be developed on wise and sound principles or the development boomerangs. He provided Nature governed by laws which have no sympathy for ignorance, no matter how well intended. And He gave Adam and Eve the job of subduing the earth and having dominion over it.

So Adam and Eve received the first Civil Engineering assignment, that of subduing the earth; taking the hostile environment outside of the Garden of Eden and by the sweat of their brows, making it compatible for the life of man. And that has been the primary job of Civil Engineering ever since; finishing the creation, applying scientific principles to the practical needs of man, assuming the constantly increasing responsibility of providing for the physical well being of all people - and in the process providing for man's spiritual and social growth and development.

For in working at the job of subduing the earth, and finishing the creation, there have been good side effects. Remember the Lord told Adam, "Cursed is the ground for thy sake"; and this has turned out to be a great blessing. Early man found that he had to work together with other men to control the floods and to conquer the mountains. He found that he needed other men, and they needed him; that every man is a part of the whole; and civilization was on its way. He found that the cooperation that was necessary to control the floods in the Nile Delta, and use the water for growing of food, was good also in other activities.

He discovered the necessity for and the power of human dignity and individual responsibility - and the overriding requirement of love, of justice and peace, and of brotherhood of all men. This march of civilization has brought us to the point where for the first time in history, physically within our grasp and within our capabilities, is a good life for every man, the elimination of hunger and poverty, the realization of dreams of all men. All we need to do is apply what we've learned about cooperation and brotherhood and mutual dependence and thus work together a little better; and then get with it.

Further, we believe all men have the inalienable right to search for and to the pursuit of happiness. The man who makes this search for happiness his chief business, never finds it. If instead, he makes his chief business service to others, happiness seeks him. Down through the ages, and in your lives and mine, the happiest people in the world are those who have useful work to do. Happiness comes from efforts directed toward the welfare and happiness of others and in accomplishment, and this is the fundamental objective of Civil Engineering.

So in Civil Engineering we have a profession that is stimulating, interesting and tremendously challenging and has been since the

advent of time. Without equal is the fascination that comes from developing a dream, through application of basic principles, to a design on paper; and then through fashioning earth and rock and concrete and steel to the realization of a project that operates to make life better for man. Being engaged in such a profession is greatly rewarding to man in his search for happiness. It gives purpose to one's life. As our little old world becomes smaller and our population larger and our social relationships more closely entwined, the work to be done becomes increasingly complex, greater in magnitude, more necessary for man's survival, and most important it becomes more effective in service.

The problems to be solved are not easy, but they are not supposed to be. This world wasn't designed as a soft place for soft people, this produces soft heads; but was intended as a testing ground to provide challenge and work and sweat and toil and achievement and reward. And in the process man develops and grows.

We sometimes act as if leisure, comfort and luxury were the end requirements of life - and they are nice - but alone they can be empty and degenerating. Actually true happiness comes from activity and work that you can be enthusiastic about. You can't just find life worth living; you have to make it worthwhile.

So in Civil Engineering we have a basic, sound opportunity for an abundant, worthwhile, happy life. What are the needs then, for us to take advantage of these opportunities so that Civil Engineering becomes the ideal profession for each of us?

Technical ability, of course, is most important and during these times of "information explosion" is something that is a lifetime job. We often are told that our half-life, after our degrees, is only about 10 years these days, so we must accept technical learning as a life-time undertaking.

In these changing times of challenge, moral integrity is most important. Technology without intellectual honesty doesn't produce the good life. Designs based on unsound principles can be evil. Construction without integrity and responsibility soon crumbles.

We are fortunate to have the great moral principles which are the foundation of our progress and culture to guide us. These principles, summarized in the Sermon on the Mount, have withstood the batterings of change and time and are as applicable today as ever. Thus the Golden Rule must be as indispensable to our profession as the slide rule.

It is most important to keep in mind the inherent great good that is in all men, and to direct our efforts toward bringing this out

in ourselves, as well as in our associates. We must never lose faith in human nature, no matter how often we are deceived. We must keep solid confidence in the real, honest goodness, generosity, humanity and friendship that actually exists in this strife-torn world. These are overwhelming in majority. I've had this proven to me time and again; even when badly shaken a time or two.

The big contribution of the Civil Engineer is his common-sense practicality approach to problems that results in action being taken. We accept the world as it is - and start from there with our projects - remembering that the "creation" is not yet finished and we have a long way to go to perfection. And I'm sure we'd have a most difficult time, in view of the great variety of thought we have in the human family, to determine just what this perfection is. Perhaps there is no such thing. So it is a problem of determining what can be accomplished in view of the circumstances and doing the best we can - with a sensible, mature approach.

It is in many ways, a hard-boiled world; but I like the motto of the great state of Kansas: "To the stars - through difficulties." For visions and the dreaming of dreams is a part of the process. We must keep the end result in sight, but always remember that the project gets built brick by brick, stone by stone, timber by timber. And these individual parts must be strong and solid and right.

Three workmen were cutting stone for a structure and gave different answers to an inquiry as to what they were doing. One stated he was working for \$4 an hour; one said he was shaping a rock; the other stated he was building a Cathedral to his God. Which do you think was doing the best job and which was the happy man?

A requirement that is increasingly important today more than ever before, and which is the big need of Civil Engineering, is to be socially effective. Our projects must, of course, be soundly for the best overall good of man. And we can do this. But our real problems are not technical, they are not physical - we know how to do and we could do much, much more than we are doing. But our projects are large, and they involve many people and they have to be accepted by many people before they can be built. The plans for our projects and the results expected must be understood and accepted by our society.

No matter how great our knowledge and our skill - no matter how great our dreams - no matter how sound our plans and designs - we can do little without the help and agreement of other people. The St. Lawrence Project is a good case in point.

From the beginning of our nations, Engineers dreamed great dreams of harnessing the power of the Long Sault and Galup Rapids; of

opening up the Great Lakes and the middle of the continent to ocean-going ships; of creating the Eighth Sea. But it took 75 years after the first plans were made before the local, national, and international agreements were reached so the project could be built. It takes a long time and great continuing effort for nations and states and groups of men, with some differences in objectives and sometimes conflict of interests to cooperatively pool their dreams and combine their efforts for the common good.

The project itself is certainly a top achievement in man's struggle to improve his environment and harness the forces of nature. But most important for the future of mankind, it seems to me, is the demonstration that international, national, local, and individual interests can cooperate and can be coordinated for positive accomplishment. It is a successful, practical demonstration of what is needed to solve many of the problems of this troubled world. And the Civil Engineer has the key role to play.

Being involved in the design and construction, was an uplifting experience. The great orchestration of men and machines, 17,000 workmen and \$90 million of equipment working around the clock fashioning and shaping the earth; these carried the melody of bringing the dreams to fruition. But also most important and an essential part of the orchestration and necessary for the melody to have substance, were the supporting backgrounds of many men and organizations and governments.

Involved in this background of support were the investors who with their savings bought the bonds that made the financing possible; the International Joint Commission and the State Departments of the United States and Canada; the Joint Board of Control of the St. Lawrence River; the Governments of the State of New York and the Province of Ontario; the nations of the Iroquois Indians; the county and the municipal entities of Government within the project area; the buyers of the power and the prospective shippers and ship owners; the many different disciplines of finance, economics, and manufacturing involved; the labor unions involved in supplying the workmen; the contractors and engineering supporting organizations not on the project; and the most important individual John Q. Citizen who influences and supports legislators and administrators of Government.

All had to be kept in harmony and all kept headed in the same direction for the project to be completed; for the melody to shine through. When this was done, the 75-year dream became reality in less than four years. And all this takes Civil Engineering in its broadest and fullest sense to conduct this great orchestration.

I visited the St. Lawrence last summer - and contemplated the soft lapping of the water against the riprap and concrete of the

dams - and listened to the singing hum of the generators as they converted the power of the falling water into the energy of 21 million slaves and sent it wheeling over the great transmission lines to cities and homes and factories to perform back-breaking work for men and make life better for people. And I watched the big ocean-going ships being gently lifted up into the placid waters of the lake to continue their journey delivering cargo to the middle of the continent. And I viewed the visitors to the parks and beaches of the project and observed the beauty of the area, which was carefully planned and built into the project. And I was humbled - and proud to be a member of the human race - and a Civil Engineer.

Of course, gone was the activity and the excitement of construction - gone was the struggle and the headaches and the sweat and the roar of equipment and shouts of workmen. Gone were the continuing crisis upon crises that are part of a large, complex, involved, accelerated, construction project. But the end results were there to see - and to feel - and to enjoy - and to marvel about - and for man to use. Is it any wonder that to me Civil Engineering is the ultimate?

The St. Lawrence Project, as with all great Civil Engineering undertakings, advances the civilizing process as the Good Lord intended. It shows what men can do in a cooperative endeavor in a positive way. It gives a glimpse of the great potential of man and of what this world could be - and can be - and will be when we finally realize what our enlightened self interests are - and get rid of our discord and conflicts - and unite all men in a brotherhood for the common good.

The real measure of a social system is not the inter-continental missiles, the moon rockets, the proximity fuses, or the hydrogen bombs which it produces. Rather it is the food and the shelter that it provides for all its citizens; and above this, the uplifting things of the spirit, the recreation, that culture that it creates, the purpose it gives to life. The real measure is the ample and abundant living it provides each and every individual of the society. Basic to doing this is the contribution of the Civil Engineer.

We have tremendous problems to be solved. In some ways it appears we have oversubdued the earth - and produced pollution and congestion and ugliness. While we now have a higher standard of living for all our people in this Miracle of America of ours, than ever before in all history, we also have problems without precedent. Our affluence has raised our expectations of life - and our unrest. Our capacity to alter our environment, along with preferences for convenience and speed and sometimes for quick returns, has headed us in some instances in the wrong direction. Sometimes it seems that

we have become the victims of our technological and economic forces.

Much has to be done to correct air and water pollution, the traffic congestion our individual freedom of movement has created, and the desecration of many of our areas. We have a tremendous job ahead of rebuilding and making our cities the great places to live that they can be; and must be for our survival. All these are largely Civil Engineering problems and we have the knowhow and the methods to resolve them.

But we need, as a people, much more than this. We need collective recognition of the problem and the solutions - we have made some progress here. We need individual and collective determination and self discipline - we have quite a ways to go here. We are testing whether comfortable people in our affluent society have the will to sustain the effort that is needed to build the world we want. And it may well be that we are approaching the point in time where we either do these things or maybe we won't be around very long.

We've been rudely jarred from our complacency, I think, with the Viet Nam experience and our Civil Rights problems. But I have great faith in individual man's sound common sense and resolve and will to solve his problems when he finally gets around to facing up to them. It seems to me that we are beginning to collectively see what must be done. And we can do it. And Civil Engineering has the key role.

Our great Cities need clean air and pure water and sewers and wider streets and more schools and more and better housing and better transportation. We know how to provide these and we can provide them. We are not short of technical know how - or cement - or steel - or money. We can provide these things if we would but get with it. The time and effort we waste and misuse in putting up with our problems and the money it costs us not to resolve our problems - this alone would provide the better facilities.

It seems silly sometimes to say we can't afford to do these things - we contemplate a 4-day week - we argue about how big a TV set is needed, as a necessity, on our relief roll lists - we dissipate two hours a day in traffic jams - we shorten our lives and reduce our effectiveness by the polluted air we tolerate. We can't afford not to resolve these problems.

What we need to make our dreams come true are character and drive and organization and leadership. We need clear thinking in our political, social, and business activities. We need appropriate Government institutions to carry out our plans. We need sound cooperations between our Governments and our businesses. We need social knowhow, coupled with courage and determination. We

need the inspiration coupled with practicality that Civil Engineering provides.

The self discipline provided by Civil Engineering training, the thorough analysis necessary to define a problem, the careful weighing of various solutions to determine the optimum, the clear thinking that is required for a successful Civil Engineer; all these uniquely qualifies the Civil Engineer for a much greater role of leadership in these times.

As members of our society, you and I must become more involved, more committed in the total activities. As builders for a better world, we are in a position of influence with our society. Our profession provides us with the vision and the practical know-how of continuing on with the creation; thus to accomplish the dreams for a better world we must help, much more than we're doing now, to meet the needs of leadership that will make a better world possible. Our profession places us in this unique situation and we must do more in overall society involvement in a positive way.

We've done well in the past - we must do better. We can do better. And this is the real challenge of our profession in our time.

Challenging, fascinating, demanding, stimulating, adventurous, exciting, rewarding - this is Civil Engineering. This is the profession that provides the opportunity for an interesting and abundant life.

As an example, a short time ago, a little over a weeks activity included my being in Argentina wrestling with problems on the John F. Kennedy Highway from Corrientes to Posadas; in Brazil on nine highway projects near Recife; in Colombia on the International Airport at Barrenquilla; in Newark wrestling with problems of the Newark Meadowlands and planning a 50,000 population development starting with 3,000 acres of New Jersey farmland; in Maine on a section of Interstate Highway across a marine clay swamp near Portland; in Vermont reviewing the location of a section of Interstate through the mountains near Montpelier; in Sacramento, California considering the problems of 125-foot high bridge piers on a Forest highway in the Sierra Nevada Mountains and an earthfill dam for a community development, and in Anchorage, Alaska tussling with plans for a 4-mile bridge across the Turnagain Arm with its 40-foot tides. Civil Engineering does indeed provide an interesting life.

When I take a careful look at the exciting Civil Engineering work to be done, and at today's young Civil Engineers as exemplified by the members of Newark College of Engineering Chapter of Chi Epsilon, I have an exuberant, dynamic enthusiasm for our profession and for the days ahead. Our problems will yield - solutions will be found - projects will be built - dreams will come true. The future looks good! Civil Engineering is the ideal profession!

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